



MAGAZINE

PRICE TWOPENCE

SEPTEMBER 1956



The *I.C.I. Magazine* is published for the interest of all who work in I.C.I., and its contents are contributed largely by people in I.C.I. It is edited by Sir Richard Keane, Bt., and printed at The Kynoch Press, Birmingham, and is published every month by Imperial Chemical Industries Limited, Imperial Chemical House, Millbank, London, S.W.1. Phone: VICTORIA 4444. The editor is glad to consider articles for publication, and payment will be made for those accepted.

CONTENTS

A Great Invention, <i>by the Editor</i>	258
One Man and His Job—The Mouse Maker	262
Information Notes No. 123	264
Garden Notes, <i>by Philip Harvey</i>	268
Copper Men, <i>by L. I. Crawford</i>	270
News in Pictures	274
I.C.I. News	278
The Reluctant Rallyist, <i>by James Taylor</i>	284

FRONT COVER. *Combe Gill, Glaramara, Borrowdale, Cumberland. Photograph by A. W. Caunt, Billingham Division.*

OUR CONTRIBUTORS

L. I. CRAWFORD was for many years president of I.C.I. (Chile) and also vice-president of *Compañia Sud-Americana de Explosivos*, in which I.C.I. has an interest. He retired in 1954 and is now living in Sussex. He is the author of several novels and has contributed articles to Blackwood's Magazine and Punch.

DR. JAMES TAYLOR has been Group Director of the Metals and Nobel Divisions since 1952. He was trained as a physicist at Armstrong College in the University of Durham and afterwards at Paris, Utrecht and Cambridge. He joined the Research Department of the Nobel Division at Ardeer in 1928 and became Research Director in 1946 and Managing Director in 1951.

A Great Invention

By the Editor

In September 1831 a certain Mr. William Bickford patented a great invention—safety fuse. Today, 125 years later, safety fuse made on just the same principles is still sold the world over. Here is the story of how a Cornishman and his son-in-law put their brains and resources behind an ingenious idea.

JUST a century and a quarter ago a certain Mr. William Bickford of Tuckingmill, Cornwall (almost the centre of the tin-mining district), patented a simple invention. Out of this invention, which was really no more than an ingenious idea, has grown a vast world-wide enterprise. Safety fuse—for that was Bickford's invention—is today sold the world over. There are companies in America, Australia, Canada, Germany, Austria, France and Soviet Russia, all of whom owe their origin and their know-how to one enterprising individual and his son-in-law in a small Cornish village.

From a small beginning so much has grown. Moreover, it is a small beginning of which we are privileged to know almost every essential detail, since Bickford's partner and son-in-law, George Smith, sat down and wrote an account of it all shortly before he died.

1831—the date of the invention of the safety fuse patented in September of that year—was also the year of the first public railway. In that year William Bickford had a brilliant idea. And no better account of the conception of an invention still holding its own in the world today can be given than by quoting the words of George Smith:

In the early part of that year my father-in-law, who had long seen and lamented the frequency of accidents causing the loss of life or limb occasioned by blasting in the mines of Cornwall, directed his attention to the means of preventing these terrible evils. He conceived the idea of making an improved kind of train to communicate with the charge of gunpowder which would be a marketable commodity. Nor was it strange that he should have thought of this, for at this time the old mode of blasting by the needle and rush had been laid aside, and millions of goose quills were annually imported from Ireland for this purpose.

The mode was this: The charge of gunpowder having been inserted in the hole prepared for blasting, the miner cut off the tubular parts of the quills and

inserted the small end of one into the large end of the other until he had a column as long as the hole was deep. He would then fill this quill column with powder and insert the bottom of it into the charge and tamp the hole. This being done, a piece of touch paper or match was applied to the powder at the top of the quill, when the men would escape, and if all was well the explosion would take place.

But this was by no means certain. For not infrequently the upper quill would slip out of the lower one under the operation of tamping, when the powder would mix with the tamping and be ignited under the tamping bar, causing a premature explosion and generally serious damage to the men. When this was not the case the flame or fire of the touch paper would be carried by a current of air to the top of the quill, and thus leave no time for the men to escape. These accidents producing the most fearful results, were awfully common. Mr. Bickford, notwithstanding repeated failures, still kept his mind on the subject.

At length the remedy was discovered. Mr. Bickford's colleague as Steward of the Wesleyan Society at Tuckingmill was a ropemaker, a very respectable man, but who occasionally still worked at his trade. Mr. Bickford, wishing to speak to him on some matters relating to the society, went to his house, and on enquiring for him was told that he was in the ropewalk. Thither Mr. Bickford found him with some hemp around his waist spinning yarn for the making of rope. Mr.

Bickford walked with him as he walked backward and went on with his work.

During the conversation the thought occurred to Mr. Bickford that if a funnel filled with gunpowder could be so fixed as to pour a small stream of gunpowder into the yarn as it was spun, and if afterwards it could be securely fastened and varnished, it would be just the thing he wanted to convey fire to the charge in blasting.

To give this idea a fair chance of success, Mr. Bickford put himself into communication with Mr. Thomas Davey, a working miner, and a Methodist Class Leader, who was very ingenious, with a great genius for mechanical contrivances. These worked together on Mr. Bickford's idea, but found that the stream of gunpowder could not be confined in the unspun fibres of hemp or flax. Having arrived at this conclusion after numerous trials, they tried flax yarns, and found to their great delight that these placed in sufficient numbers around the mouth of the funnel containing powder and twisted as they were drawn out, received and contained a column of gunpowder in the centre of the loose cord so made. They then, after various efforts, devised a mode of passing another series of twines around this cord just at right angles to the twist of the first threads: this process made the cord firm, and when passed through a tar varnish it became a fuse impervious to any ordinary damp and adapted to convey fire to any charge of powder and to resist the action of any ordinary tamping.

I had marked every progressive step in this invention, and although I had at the time no idea of its



WILLIAM BICKFORD, 1774-1834
Inventor of safety fuse



GEORGE SMITH, 1800-1868
Pioneer of safety fuse



THE YARD AT TUCKERMILL in the 1870's, showing on the left the original factory, still there today, in which safety fuse was first made on the ropewalk principle

being of much pecuniary value to the inventor, I had a very sanguine opinion of its vast superiority in point of safety to everything previously used for the purpose of conveying fire to the charge in blasting.

George Smith, who wrote this account, was the son of a carpenter. He was then just 31 and had established for himself a small but successful building business. He had married Bickford's only daughter, Elizabeth, only four years previously. His account of that courtship and marriage takes us right back to the devout atmosphere of those days.

"I may mention," wrote George Smith in the unfinished manuscript of his autobiography, "that the second time I saw Miss Bickford was at a prayer meeting which I was opening. I was then so struck that I forgot to repeat the Lord's Prayer."

A happy marriage ensued, and with it a happy relationship between father-in-law and son-in-law. Together they collaborated on the development of Bickford's invention, for which royal letters of patent were granted by William IV.

In the early days safety fuse was made on the ropewalk principle. A girl with a coil of hemp wound round her waist would walk the length of the shed, twisting the hemp as she went, while another girl poured gunpowder down a funnel in the centre of the coil. Twenty-four feet was the distance the girls were asked to walk, twisting the hemp as they went; and it is in multiples of twenty-four feet that all safety fuse is sold to this day.

The new fuse—called safety fuse from the beginning—was first tried out in the Cornish tin mines. Although its success was immediate, sales were at first not so easy. "In every large mine," wrote George Smith in his memoirs, "there was some relation of the manager or purser, or the purser or manager himself, who supplied the mine with quills, and the profit on these was a consideration which had weight."

It was not long, however, before the use of safety fuse extended beyond the Cornish mines. In 1838 the new safety fuse scored a spectacular success in the blasting of rock under water to deepen the Kingstown Harbour in Dublin Bay. The laborious methods

which safety fuse displaced sound almost incredible today.

Before the fuse was known, the work was carried on thus (*wrote George Smith*): a large diving bell was lowered on the part of the harbour from which the rock had to be removed. Of course, a vessel or vessels had to be moored just over this spot with sufficient machinery and power to lower and raise this ponderous diving-bell, with all its contents, at leisure. These preparations being made, the bell with the men were lowered to the bottom of the harbour, and the men proceeded to bore one or more holes as the state of the work required.

They would have with them tinplate canisters just the size of the hole and long enough to contain a sufficient charge of gunpowder, with a small tube arising from the top of the canister. The canister would then be filled with gunpowder and placed in the hole. The top of the small tube just mentioned would have a brass collar prepared with a screw to receive another such tube, and this, similarly prepared, would be screwed on to it, and then the signal to have the bell raised would be given. As this was done tube after tube would be screwed on until the bell was raised fairly out of the water and the top of the last tube was some distance above its surface. A piece of red-hot iron wire was heated from a fire kept for the purpose on board the vessel and thus the explosion took place, when the diving-bell had to be again lowered and the operation repeated.

Safety fuse soon put paid to this method. Treated with a waterproof coating of tar, it burnt as freely under water as in the air, and so eliminated the laborious work of erecting a tube from sea bed level.

The success of the Kingstown Harbour operation set the seal on the reputation of safety fuse. Within a year the War Office sanctioned its military use and placed large orders. Within a year, too, manufacture was sanctioned to begin in America by a company called Bacon, Bickford, Eales & Co., with Bickford Smith & Co. holders of minority shares granted in return for know-how. Other overseas companies followed at intervals: Davey, Bickford, Smith & Co. in Saxony at Meissen (1843); France (1844); Bickford



WOMEN AT WORK in the 1890's in the coiling room of the French safety fuse factory at Chartreux

Vienna (1879); and at Bendigo Bay, Australia (1884).

Indeed, it was not the success of safety fuse that absorbed the attention of its inventors so much as the fear of piracy by others. In 1842 a certain Mr. Skewes paid court to one of the girls working in the Bickford Smith factory and induced her to part with the firm's secrets. Skewes set up manufacture on his own, albeit of an inferior grade; and to obtain an injunction against Skewes was a tedious business that caused George Smith a lot of worry. The matter came to the Court of Appeal, where Smith was horrified when his lawyer spoke briefly, almost to the point of curtness.

But George Smith did not know what his lawyer knew—that the judge had an early dinner engagement which he wished to keep! An injunction was duly obtained.

George Smith was succeeded in 1855 as factory manager by his elder son, who became a Liberal

(Continued on page 265)

The Mouse Maker

INSIDE the mouse factory Frank Kabat bent assiduously over his task—making a mouse.

Now, lest there be any confusion, let me explain that when they talk about a mouse over at the Alkali Division's Holford brinefields, where Frank works, they do not mean the wee tim'rous beastie that has been known to provoke demure maiden aunts to perform unimagined feats of athleticism. They mean instead a ball of straw, tightly packed and bound with barbed wire. By passing it through mains carrying water, brine and other process fluids, scale which collects on the inside of the pipes is removed. The operation is known as "mousing."

But then, if Frank's mouse is not like most people's idea of a mouse, neither does his place of work resemble the popular conception of a factory, occupying as it does a brine well derrick house with its open doorway giving on to the rural spectacle of a herd of cattle browsing philosophically in their Cheshire pasture.

Frank drew a length of straw rope—the kind used universally for lagging pipes—from a great bobbin. Flexing a sinewy forearm, he began to wind the straw tightly into a ball. Next, his gloved hand reached out for twine. With this he bound the straw ball, the network of twine keeping it in what looked to me like a perfect sphere about the size of a medicine ball. This he passed through a section of pipe which serves as a gauge. The ball slipped easily through with just a little room to spare. It told Frank just how much wire he would need to make it a really tight fit.

Frank changed his gloves, discarding the thinner protective gauntlets for a pair of tough leather mittens. He seized the barbed wire, stuck the end into the ball and drew it firmly across the straw, hammering it home with a wooden mallet. Dexterously he wove a neat mesh all over the ball, tying it at intervals with short strands to keep it from working loose on its repeated journeys through the main.

"How many pairs of gloves do you wear through in a week?" I asked, noting how unconcerned his hand

passed over the vicious barbs. "Sometimes two; sometimes three," came the reply.

For handling the wire Frank had laid out in a tray like a surgeon's instruments the usual wire cutters and pliers, and a variety of spiked tools that he had selected and adapted for the job. Two of these, he told me, had once formed the prongs of a hay fork. This gave me a clue to his resourcefulness; a resourcefulness no doubt born in the course of earning a non-too-easy living between the wars in his native Poland. His real name, I later discovered, is Franciszek. He had come to Mid-Cheshire with a unit of the Free Polish Army in 1942.

Piled neatly at his side were the products of his handiwork. They ranged from spheres weighing 20 lb., like the one he was just finishing, to balls small enough to mouse a three-inch main. Frank makes them all and has acquired a fine eye for judging the correct size. Many of them were cylindrical "bullets." This, I learned, is a fairly recent improvement for mousing some mains because the cylinder provides a larger scraping area.

The demand for Frank's products is steady, since the mousing technique is in constant use throughout the 100 miles or so of mains controlled by the Brine and Water Works. Not only does it clear scale that has already formed, but regular mousing helps to prevent scaling.

Mousing frequently improves the flow capacity of a main by 30%, and it has been known to achieve as much as a 55% improvement.

The old method of cleaning mains was to use a bladed scraper, but experience showed that too often this was rendered ineffective by slight variations in the diameter of a main. Frequently it became jammed in bends, necessitating many man-hours in opening up the affected part.

The straw-ball mouse was the brain-child of one of the Brine and Water Works men engaged on mains cleaning, Super/Chargehand Fitter Jim Scott. It won him a total of £1000 under the Company's Suggestion Scheme, and has been adopted by several other Divisions. I.G.



Frank Kabat

Information Notes

RISING SHIPPING COSTS

By Ronald Farquharson (I.C.I. Shipping Manager)

Every year it costs more to deliver a ton of I.C.I. products to overseas markets. Hitherto the overseas buyer has generally absorbed these costs. But now the market will not always stand it. Here is a review of the difficulties British shipowners and exporters are facing.

IN 1953 I.C.I.'s freight bill for ocean and coastwise shipments amounted in round figures to £5m.; in 1954 it rose to £6m. and in 1955 reached £6½m. While it is true that total tonnages shipped increased over the same period by approximately 5% (in 1955 the figure was nearly 1½ million), no useful deductions can be made by comparing these figures; this is because of the fluctuating quantities of high and low rated products and of the varying proportion of coastwise as opposed to ocean shipments which make up the Company's freight bill.

There is only one certain conclusion: the fact that year by year it is costing I.C.I.—and exporters in general—more and more to deliver a ton of products to overseas markets.

Actually, in effect, it is generally the overseas buyer who is called on to absorb these rising costs; but there have been recent instances of I.C.I. reducing its normal margin of profit to counteract a freight rate increase in order to maintain a c.i.f. price against foreign or indigenous competition. Before doing this, I.C.I. has invariably stated its case to the Shipping Conference. Often some form of compromise has been arrived at. Our company is, however, exceptionally favoured in its ability to negotiate, due to the magnitude of its freight bill and the fact that it is in direct and daily touch with the shipowning interests at all levels. The small exporter, particularly if he works through a shipping agency, is unlikely to achieve any sympathetic hearing regarding the rates he is required to pay.

The shipowners are frequently criticised for their arbitrary attitude towards exporters, particularly in that they impose—rather than propose for prior discussion—periodic increases in rates ranging from 5 to 25%.

But before accepting any such criticism it is essential to bear in mind two important factors. The first is that the shipowners, despite their apparent autocratic attitude, are both astute and far-sighted: they are aware that a valuable

export lost to Britain is a valuable cargo lost to British shipping; and, generally speaking, this consideration is not lost sight of when rates are fixed. The second factor must be dealt with in greater detail: it concerns the ever-increasing costs of both operating and replacing ships, of relentless competition through foreign governments sponsoring entry into the sea-lanes of non-maritime nations, and the trend towards "flags of convenience" and "flag discrimination."

Since the war, ship operating, repair and replacement costs have risen more than freight rates; and the owners are not, as has been suggested in the past, preserving an even economy for themselves at the expense of the exporter. Ship operating costs include seamen's wages, bunkers and—most vital consideration of all—speed of turnround. Wages have risen at intervals, culminating in two fairly substantial increases within the past twelve months. Fuel oil has been subject to sharp rises, usually without notice, thereby precluding the owners from any immediate compensation from cargo interests.

Wage and fuel factors, however, have affected more or less all industries alike: where the shipping industry is suffering a more unique and expensive problem is in the greatly retarded turnround of vessels both in Britain and at main ports abroad. This arises from inadequate harbour facilities to meet increased world tonnages and from other causes. Before the war a normal cargo carrier completed every year an average of over three round voyages between Liverpool and the run of Australian ports. Now it is fortunate to average two and a half. (This despite the increased speed of modern ships.) The difference represents idle time (loading, discharging, or awaiting a berth), when the vessel is not earning money but still costing her owners an average of £750 a day. The loss to the shipping industry is huge and probably incalculable.

Repairs are a factor again probably much in line with

the increasing maintenance costs of industry as a whole; but the replacement of ships is a more formidable proposition than the replacement of plant, in that in the case of a vessel the outer structure must be replaced as well. The active life of an ocean-going ship does not generally exceed thirty years, and the cost of replacing a 7000–8000-ton vessel is today approximately four times more than the sum paid for its predecessor. Since the building yards in Britain invariably quote on a cost-plus basis with no positive guarantee of completion date, this adds to the uncertainties of return on capital outlay and has indeed caused certain owners to place orders for new tonnage abroad on a firmer basis.

In addition to the post-war revival of ex-enemy shipping (particularly Japan), such non-maritime nations as India, Egypt, Israel, Argentine, Brazil and Chile have formed their own mercantile marine. In most cases these foreign lines are affiliated with the British conferences, which protects the shipping industry as a whole from rate-cutting; at the same time their existence has reduced the proportion of world trade carried in British vessels.

Here "flag discrimination" has also played no small part in contributing cargoes to national as opposed to British shipping: it comes about through the simple expedient of the foreign importer including a condition in his order that the goods must be shipped in a vessel belonging to his own country; and since the governments concerned are encouraging this practice more and more and the British importer is operating in a buyer's market, it is a matter of growing concern to British shipowners.

A GREAT INVENTION (continued from page 261)

Member of Parliament and took the name Bickford Smith to distinguish himself from other Smith M.P.s.

Bickford Smith addressed himself seriously to improving the organisation of the works. His notebook from those days still survives. We find such entries as the following (the italics in parentheses are the comments of a later works manager):

"There is no account kept of the times the girls come to work or the time they leave work." (*We presume in those days the workers were put on their honour: we can only hope that confidence was not misplaced!*)

"The entries of the Fuse made are all made from the statements of the girls and not from measurements or weights." (*A crude method of recording output!*)

"I must have an account of the Fuse made by each spinner and by each machine." (*Sounds a very reasonable demand.*)

"I must have a mode of testing the amount of work done daily." (*Keep at it, Mr. Bickford Smith you are on the right track!*)

"What must I do by girls who stay away without leave?" Answer: "Spale two days or turn them away." (*"Spale" is a Cornish term and means that the girls would lose two days' pay, although presumably they worked the greater part of the time. Distinctly illegal in these days. Where was the trade union?*)

In lesser degree "flags of convenience" are also menacing the hereditary supremacy of British shipping. The practice consists of operating ships under the flags of say Panama or Liberia, thereby escaping a heavy burden of taxation and avoiding the expensive regulations required by the International Maritime Convention to which such countries are not party.



... these foreign lines

The best future of British shipping and British exports must surely lie in closer consultation between representatives of both sides. In the past the predominant voice has been that of the owners, who are strongly organised together under the protective umbrellas of a Grand

Council, Liner Committees and individual Conferences. It has not been easy for the exporter to penetrate such an "ivory tower" and obtain a sympathetic hearing. The need is urgent for a greater sense of mutual purpose; and, with that end in view, over sixty prominent trade organisations concerned with exports have recently formed themselves into a British Shippers' Council in the hopes of meeting the owners on more level terms—and indeed have already done so on the matter of diversionary clauses on bills of lading.

"If a girl asks me if she may stay home for a day or leave work early, what am I to say?" Answer—"Sparingly." (*A very judicious reply!*)

Today safety fuse manufacture is still based on the same principles as 125 years ago. But although the principle may be the same, the methods have, of course, improved. The old waterproof covering of tar, so successful in Kingstown Harbour, has now been replaced by a covering of bitumen, gutta-percha and cotton, which is in turn coated with a china clay mixture. There are devices which stop the machines if the intake of gunpowder momentarily fails. There are new tests for measuring the strength and evenness of burning. There are new buildings now in the course of erection. Most of these improvements have been made since the company became part of I.C.I. through its merger with Explosive Trades Ltd. (later Nobel Industries Ltd.) in 1918.

All Bickford Smith's safety fuse sold in this country burns at a speed of between 80 and 100 seconds per yard, and the reputation and efficiency of the Bickford Smith fuse are such that it still holds its own in metallurgical mining against the electric detonator. And in many parts of the world where you would have expected to see indigenous manufacture start up, they continue to import the old and well-tried Bickford Smith safety fuse, still holding its own after 125 years of unceasing production.

A NEW I.C.I. DYESTUFF

By K. A. Lunn (Dyestuffs Division)

I.C.I.'s 'Procion' dyestuffs are something radically new. They have the unique property of actually combining chemically with the fabric by a chemical reaction that takes place rapidly under alkaline conditions. Rapid, uniform and lasting absorption of the dye is thus obtained. The first three colours of the new range are yellow, blue, and a brilliant red.

IT is a hundred years since Perkin discovered the first synthetic dyestuff, and the great surge of invention and new discovery to which this event gave rise has, understandably, now dwindled to a more moderate tempo where the work is one of refinement and gradual improvement rather than of rapid and exciting expansion of the available range of dyes.

Any new dyestuff now qualifying for development must fulfil one or more of the following conditions: it must give a shade or a fastness performance unobtainable with existing dyes; it must show processing advantages as compared with existing products; or it must give an equal performance at a lower cost. Dyestuffs Division's large-scale research and development programmes are, of course, continually giving rise to better dyestuffs or improved brands of existing dyestuffs, but it is only infrequently that such improved brands or new discoveries are striking enough to attract public notice.

Now comes news, however, of another outstanding I.C.I. achievement in the dyestuffs field—the discovery and development of the 'Procion' dyestuffs, the first three of which (a yellow, a brilliant red and a blue) have recently been put on the market.

To appreciate the importance of the 'Procion' dyestuffs it is necessary for the non-technical person to know something about what is called the "affinity" of a dye. This is the name given to the powerful physico-chemical forces that bind the molecules of a dyestuff to the fibre on which it has been dyed. It is the magnitude of these forces that hitherto has determined the wash-fastness of any soluble dye.

The new 'Procion' dyes go beyond this conception of affinity. Unlike other classes of cellulose dyes, which in their soluble forms attach themselves to the fibre through the action of purely physical or electromagnetic forces, the 'Procion' dyes have the unique property of actually combining with the cellulose by a chemical reaction. This

reaction proceeds rapidly under alkaline conditions, and this fact, in conjunction with the high solubility of the dyes in water, makes them ideally suited to modern high-speed continuous dyeing techniques. Good penetration (and not just surface dyeing) of the fabric is obtained, and uniform absorption of dye across the width and along the length of the rapidly moving fabric is assured.

The 'Procion' dyestuffs now introduced by I.C.I. are, in fact, the vanguard of a new generation of dyes ideally adapted to the needs of the new machine age of the dyer, while their brilliance of shade and excellent washing and light fastness will appeal to the final consumer.

The use of the new dyes, however, is not restricted to modern high-speed continuous dyeing methods only. In fact, most dyers, including many producing top-quality dyed yarns and fabrics, are still using the older-established batch methods of dyeing. In these cases the 'Procion' dyestuffs, which are as fast to washing as the best vat dyestuffs but give brighter shades, can be applied by a novel and attractively economical cold batch-dyeing process specially developed by I.C.I. and for which patent protection is pending.

The first three of this important new range—'Procion' Yellow R, 'Procion' Brilliant Red 2B and 'Procion' Blue 3G—are principally for dyers and printers of cotton and cellulosic fibres, although they are also expected to find wide use for dyeing nylon and for printing wool and silk.

'Procion' dyes used on cotton, viscose rayon and linen possess high fastness to washing, perspiration, rubbing and light. They are therefore expected to prove of special value for dress fabrics.

For textile printing, the 'Procion' dyes are readily adaptable to established procedures, a simple printing recipe being sufficient to apply them satisfactorily. In conventional steaming equipment the time employed for "fixation" can be anything between 2 minutes and 60 minutes—a very convenient factor for prints using different classes of dyes. Alternatively, however, the 'Procion' dyes can be fixed by merely impregnating the printed fabric with an alkaline solution and then drying it by passage round steam-heated cylinders. This process is simpler, speedier and more economical than the steaming method of fixation and will undoubtedly appeal to cost-conscious printers everywhere.



Established batch methods

Reprinted by permission of

THE FINANCIAL TIMES TUESDAY JULY 10 1956

DEPARTMENT OF OPTIMISM

By HAROLD WINCOTT

SOMETIMES, when I contemplate the economic future of Britain, I feel that a gas oven and a pocketful of shillings would not be inappropriate. Sometimes, I get almost cheerful. Last Tuesday was one of my brighter days.

I had been invited to what Imperial Chemical Industries calls a Work Study Open Day. Frankly, I wasn't frightfully keen. I suspected I'd been asked to listen to a bunch of earnest chaps from I.C.I. plants all over the country recounting their experiences with a stop-watch and how often and how long other chaps popped off to the lavatory for a smoke.

I got the surprise of my life. There were some I.C.I. people there: Mr. R. M. Currie, head of the Central Work Study Department, and two or three of his assistants. For the rest, the company consisted of people from the Services—was it two or three Air Marshals I met?—industrialists, trade unionists, civil servants and university economists. And me.

In the morning we listened to a series of talks, illustrated by charts, diagrams and films. After lunch there was a discussion, questions and answers, criticism of what we'd heard. And all about Work Study.

Work Study

WHAT is Work Study? First, to make plain what it is not. It is not new. And it is certainly not the exclusive property of I.C.I.; it is practised in one form or other by the Services, the nationalised industries, private enterprise concerns large and small, and, of course, by the independent industrial consultants. On the positive side, it is simply systematic common sense applied to all aspects of industrial production—capital investment, maintenance, and the productive and even the so-called non-productive processes. It takes full account of the human implications involved in increasing productivity, so as to enlist the greatest intangible asset of industry—the pride of a man in his job.

The theory of the science doesn't matter very much for our present purposes, except to say that its main objective is to make management manage better, for, if that is achieved, the effects will permeate through the whole structure of the organisation. What made the thing come alive to me on Tuesday were the examples of work study in practice and the benefits it has yielded.

U.S. Outpaced

THERE was the copper tube drawing plant, with a performance in some processes three to four times as good as anything in the United States, the layout of which was planned with the assistance of the Work Study people aided by a flow process chart. There was the foreman's effort on the catalyst plant. He charted what was involved in its periodic inspections, saw how the process could be rationalised as a result, and saved 32 per cent. of the time involved.

There was the "multiple activity chart" analysis of a plant where maintenance over a 14-month period was cut from 53 days to 40 days. There were the successful attacks on Parkinson's Law among the clerical staff. There was the overhaul of the arrangements for testing and checking cast iron cooling water pipes. To-day, after a capital investment of a mere £25, one man working alone tests 200 pipes a day where previously two men working together checked between them only 180.

Well, one could go on for a long time like this. I'd like, however, to give you some other impressions of Tuesday. First, it does seem that once initial suspicions have been overcome, work study can become an integral part of an undertaking. What I mean is this. I.C.I. now has 1,400 men engaged whole time in work study activities, but they will not necessarily spend

their entire lives in this field. They're just as much part of the I.C.I. team as any of the 115,000 people the company employs. I mentioned the foreman who did his own piece of work study on the catalyst plant. One of the lecturers on Tuesday was a works manager until he recently joined the quite tiny central work study HQ. A chargehand can be made a work study officer—and then subsequently go back to his original job (if he isn't promoted in the meantime).

This inter-changeability seems to me to be terribly important. It does away with "we" and "they," with the suspicion that white-collar specialists who never did a real day's work in their life are snooping around poking their noses into other folks' affairs. It ought in the long run to do away with work study specialists as work-study techniques become fully integrated into the management structure. In fact, Mr. Currie says quite cheerfully that the aim of the work-study people as such is self-extermination.

Large Dividend

SECONDLY, I.C.I. does seem to have sold the idea to most of its employees and many of the unions. To put matters at their lowest level, this is not surprising. I was given, in confidence, I.C.I.'s capital investment in work study and the monetary yield directly attributable to it. The dividend is astonishingly large. The workpeople get approximately half of it in incentive payments and much has also gone in holding down prices. But this is not the only test. I.C.I. believe their employees prefer to be intelligently employed. I believe they're right.

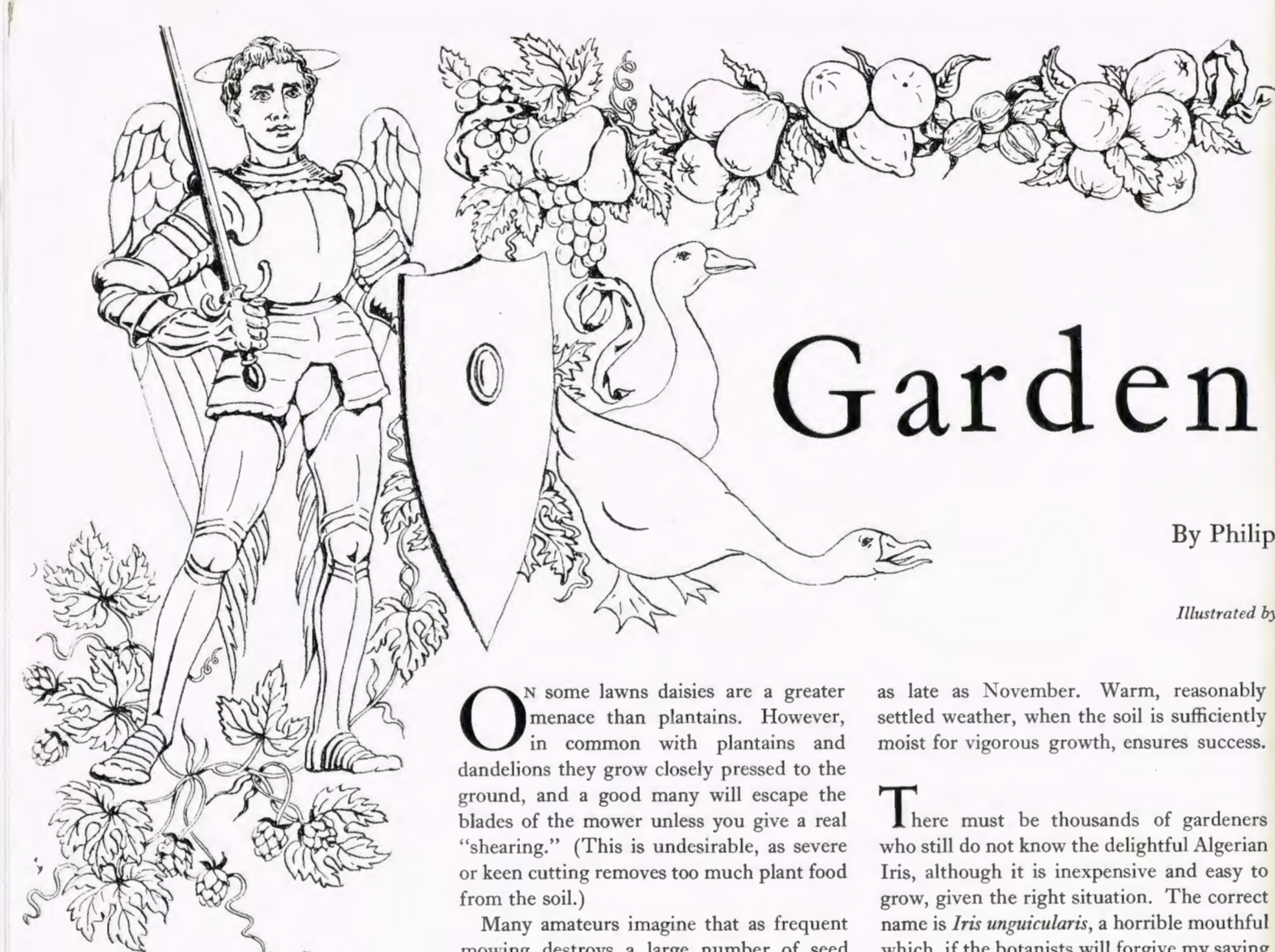
Finally, I was terribly impressed by this concept of "open days." They have been running since 1953, and if you want to go to one there's not a hope until next November at the

earliest. Here's a British company that in recent years has not only been a major participant at work study conferences throughout the country, making a present of its know-how to all and sundry, but keeps open house for anyone with similar experience and similar problems, a forum where you can learn, contribute and criticise. Competitors of I.C.I. have been there; people with not the remotest connection with I.C.I., or any of its activities. At the discussion on Tuesday, one director of a very well-known company reported progress on two of his chaps who'd gone to I.C.I. to learn about work study for 12 months and are now back with their own company boosting output and cutting costs.

Communist Attacks

ANALYSIS of productivity figures shows a pre-war rate of progress in I.C.I. similar to the national average of those days, but in the post-war years productivity in I.C.I. has been increasing at nearly three times the national rate. In 1955, I.C.I. was paying between three and four times pre-war rates for such things as raw materials and labour. (It was only paying two-and-a-half times the pre-war rate to its shareholders!) But on average it was charging its customers less than twice the pre-war level for its products. Of course, work study hasn't done all this by itself. But it's made a mighty big contribution. In fact, if you want to test just how important it is, read the Communists' attacks on it. Or ponder on the fact that there are 23 residential schools in Western Germany concentrating on it.

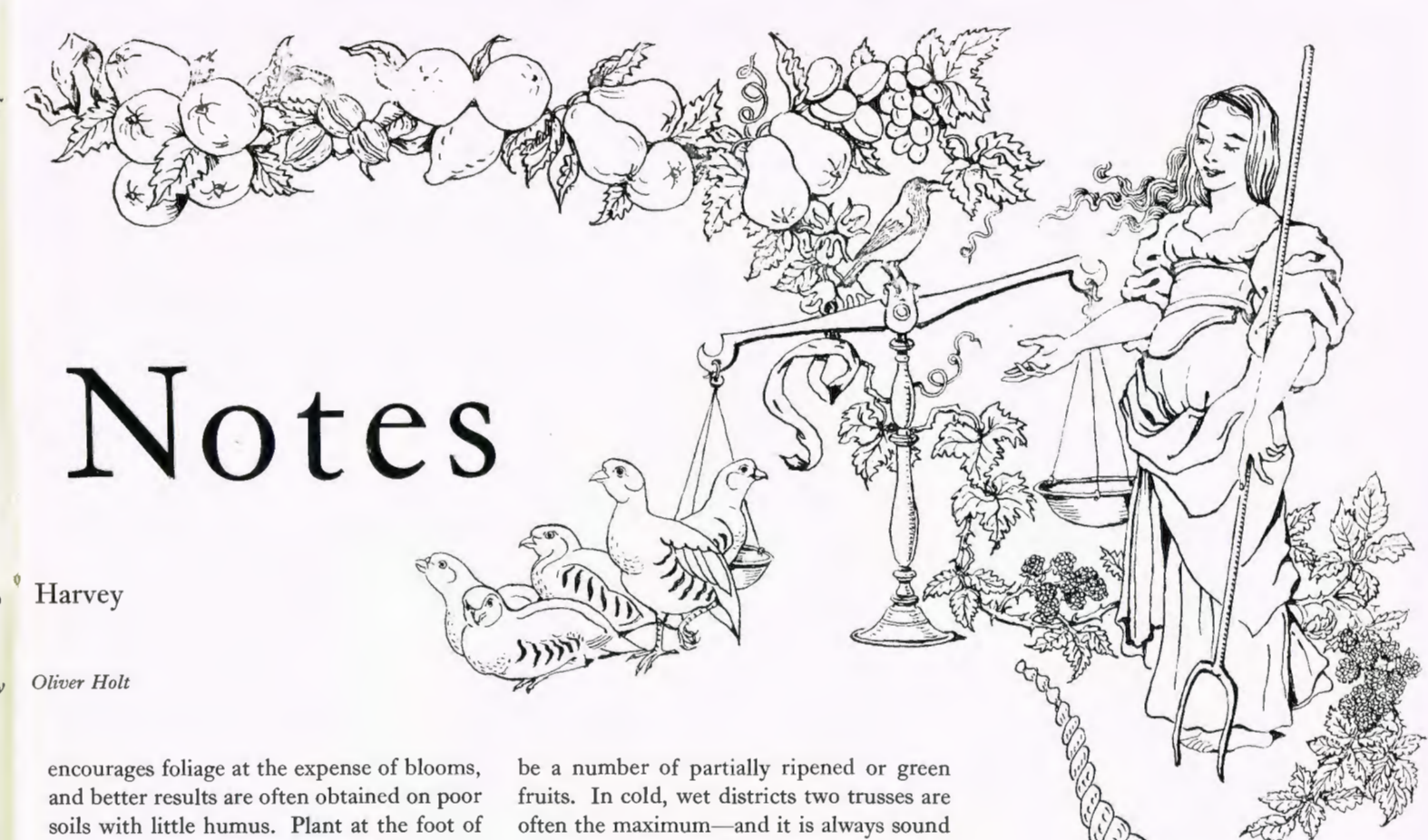
Well, now you know why I was feeling cheerful last week. And then I read Mr. Arthur Horner's speech challenging private enterprise to keep its prices down like the coal-mining industry! And how busily the Labour Party is concentrating on distributing old wealth rather than creating new. Have you got ten shillings for a ten bob note?



Garden Notes

By Philip Harvey

Illustrated by Oliver Holt



ON some lawns daisies are a greater menace than plantains. However, in common with plantains and dandelions they grow closely pressed to the ground, and a good many will escape the blades of the mower unless you give a real "shearing." (This is undesirable, as severe or keen cutting removes too much plant food from the soil.)

Many amateurs imagine that as frequent mowing destroys a large number of seed heads of daisies there is no need to bother about a selective weedkiller. They would soon be disillusioned if they bent their backs and examined the lawn at close range. Daisies increase not only by seed but also vegetatively, i.e. individual plants produce shoots which quickly develop into daughter plants, the original crown becoming a vigorous clump.

When 'Verdone' is applied in early summer two applications are usually needed to wipe out daisies—if you wait until September one application will often give a really good kill.

Maybe daisies are non-existent on your lawn, other equally pernicious weeds like creeping buttercup, dandelion and so on being the real problem. A September application of 'Verdone' is equally effective against such weeds, but it is advisable to put it on as early as possible in the month. The operative word is "advisable" because very good results have occasionally been obtained

as late as November. Warm, reasonably settled weather, when the soil is sufficiently moist for vigorous growth, ensures success.

There must be thousands of gardeners who still do not know the delightful Algerian Iris, although it is inexpensive and easy to grow, given the right situation. The correct name is *Iris unguicularis*, a horrible mouthful which, if the botanists will forgive my saying so, is a fairly frequent result when they decide to change a plant name. The old name was *Iris stylosa*, and the plant is often catalogued as such.

This iris bears lilac or lavender flowers. The falls have a deep yellow throat-mark, and the entire flower has a definite air of refinement. There is no real stem, the flowers coming on a slender perianth tube about six inches long. The plant is evergreen, the leaves growing to about two feet in summer.

The foregoing is a short, semi-technical description of this remarkable iris, which really deserves all the superlatives. Its great merit is that flowers will appear intermittently from November to early April except during hard frosts. They are fragrant, and if cut in the bud will open indoors.

I mentioned earlier that *Iris unguicularis* was easy to grow, given the right position. It demands light, well-drained soil, preferably with mortar rubble added. Rich ground

encourages foliage at the expense of blooms, and better results are often obtained on poor soils with little humus. Plant at the foot of a south or south-west wall which provides some shelter in winter and encourages early flowering. (This iris is perfectly hardy, but severe frosts will spoil the flowers where the plant is right out in the open.)

If the previous summer is very wet, flowering may be delayed until well into the New Year, as the rhizomes obviously ripen better if there is plenty of sun. Incidentally, slugs and snails are very fond of *Iris unguicularis*, so keep a regular watch on the base of the plant, as the semi-dormant buds are often attacked long before they start to develop.

Textbooks advise April or September planting. In my experience September is always better, as the soil is usually more moist. The plant must never suffer from lack of water for some months after it has been moved, although when well established *Iris unguicularis* will stand prolonged dry spells without a murmur.

At half a crown there is surely no better buy, even if a little patience is needed. There may, in fact, be few if any flowers for a year, but I can assure you that in this case realisation more than exceeds anticipation!

Whether you have allowed three or four trusses on your outdoor tomatoes there will

be a number of partially ripened or green fruits. In cold, wet districts two trusses are often the maximum—and it is always sound policy to gather all green tomatoes by the end of September, if not earlier, before the first frosts begin. One can, of course, sometimes pick fairly good tomatoes well into October, notwithstanding the loss of the majority of leaves. Fully ripe tomatoes should always be gathered immediately, otherwise the ripening of the other fruits is definitely retarded.

All green or partially ripened fruits will colour properly indoors if care is taken. Tomatoes intended for storing must be picked when bone dry, especially round the calyx. Moist or bruised fruits never ripen satisfactorily.

Window ledges will serve quite well, provided the tomatoes never touch the glass, as this may lead to tomato scald (wrinkled, white patches on the fruit).

Temperature rather than light is the key to successful ripening. Arrange the tomatoes in single layers in trays in a cupboard or drawer where the temperature does not fall below 52° F. It is best to mix ripe and unripe specimens, as the former produce a small amount of gas which accelerates ripening. Separate the rows by means of strips of newspaper, as the fruits must not touch one another.



Copper Men

By L. I. Crawford (formerly President, I.C.I. (Chile))

Ten thousand feet up in the mountains of northern Chile lies the world's largest single deposit of copper ore—at Chuquicamata. From there copper ingots are shipped to Metals Division at Birmingham. Behind this exploitation of a remote mountain fastness lies a fascinating story of one man's determination and enterprise.

Photographs by courtesy of the Chile Exploration Co.

ONE of the few human-interest exhibits in a highly specialised New York museum devoted to mining is the Copper Man. He is—or was—a South American Indian, and he lived in the times before the Spaniards came to his part of the world. Equipped with a heavy hammer—a six-pound lump of stone lashed with rawhide to a wooden haft—and a large leather bag, he chipped and crawled and chipped again, following a vein of high-grade copper ore.

From what occurred, one gathers that it was a one-man occupation. For the roof caved in on the Indian miner and sealed him up in his crevice; and either nobody cared, or nobody knew, what had become of him. There he stayed until, centuries later, modern copper men found this other copper man.

They told me the story on the spot, while we looked at the old stone hammers in the office of the mine superintendent.

"But what's he like?" I asked. "Just a skeleton, I suppose?"

"Why, no," said the mine official. "He looks pretty good, at that. Near as we can figure out, the seepage through the rock—and there's more moisture than there seems to be, up here in these darned hills—well, it coated him with copper. Kind of copper-plated him. He's no oil painting, of course, but very, very interesting to students of metallurgy."

"Does he—er—keep?" I enquired delicately.

"Sure he keeps! He stays in good shape." The engineer stared out over the vast crater of the mine

and its giant staircase of benches, where, far below, the trains of cars looked like tiny moving caterpillars. Then his long-distance gaze wrinkled down at the stone hammer in his hand, and he smiled. "But they do say that when the copper market hit the low, back in 1932, he sweated some!"

Until within the last hundred years all mankind were, in mining technique, still Copper Men. They picked and scraped here and there, looking for the high-grade ore—first in Europe, and later, as the world widened, overseas. The British Isles were for long an important producing centre, and South Wales was the centre of the know-how. Then when the Spanish colonial embargoes were out of the way, Chile became a major source of supply. Welshmen and Cornishmen went out to Coquimbo to work mines, to deal in concentrates, and to excite the derision of the Chilean miners by buying up the spoil tips of the primitive diggings, which everybody knew were just waste.



THE WORKING FACE of the world's largest single deposit of copper ore—at Chuquicamata, 10,000 ft. above sea level in Northern Chile

(Fortunes were made from this—the dumps were largely copper pyrites.) There are still many Welsh and Cornish names in Chile as a legacy of those days, though few remember why.

Then, as the nineteenth century grew older and the wagon trails began to stretch ever further towards Oregon and California, new sources of copper were discovered. It became known, bit by bit, that along

the line of the world's mountain backbone, the Rockies and the Andes, there lay many scattered deposits of copper ore too poor to pay—investors' graveyards.

Sensible people left these alone. Copper continued to be a semi-precious metal, and was known as red gold. And still the concentrates were mostly shipped off to Swansea in the time-honoured way.



THE COPPER REFINERY at Chuquicamata

It is scarcely more than sixty years ago that geologists filled in the copper picture. Put simply, what it showed was this. There were sometimes enormous lodes of copper under the surface of the ground, of which the low-grade deposits on the surface were just an indication, much as an iceberg has seven times as much bulk under the water. These great bodies of ore were described in mining literature as "porphyry" coppers.

They were identified, one by one, from Alaska to Chile—huge underground pockets containing millions of tons of ore. They remained for years a geological curiosity. For they could not be worked, of course. They mostly ran to no higher than 2% copper. And what could you do with that?

Eminent among the pioneers of mining in the last century was a man called Daniel Guggenheim, with a vigorous family of sons who followed in his steps. They, and others who thought on the same lines,

began to brood upon these huge, useless ore bodies, the porphyries, thinking of them not as percentages of copper per ton of ore, but as endless tons of copper waiting to be sold.

Year by year Daniel Guggenheim belaboured those recalcitrant ores, spending a fortune on experimental work, until at last the lodes yielded their secret and gave copper at a commercial price. Soon it was a better price than that. The world got copper in huge quantities, cheaper than ever before.

So, in the early years of this century, newspaper readers began to be aware vaguely of Calumet and Copper Queen, Kennecott, Utah Copper and Anaconda, as the porphyries opened up and grew. Soon there was one of them going in South America—Braden, sixty miles south of Santiago in Chile—

whose darkish ingots the Metals Division of I.C.I. were to know very well over many years.

Mines are seldom beautiful, and the porphyry coppers are nearly all at great altitudes, in particularly forbidding wind-swept mountains or surrounded by aching deserts. Braden is high and desolate enough, but it is more fortunate than most porphyries. The rich and smiling fields of Central Chile, vineyard and pasture and plough, lie only a score of miles away down the frothing river valley; and Santiago—a capital city of a million people—is only two hours away by car from the foot of the mine railway.

Yet there was still one porphyry untackled, the biggest of the lot, the largest known single deposit of copper ore in the world, which even the later discoveries in Africa were not to surpass—Chuquicamata in Chile, twelve thousand feet up, a windy wilderness of low-grade copper ore, miles high and miles deep. Even now, when the visitor asks to know the extent

of the ore body, he gets in reply the one word: "Unlimited!" They do not mean quite that, of course. They mean that the mine will become worked out at a date so remote as to be not worth considering.

Chuquicamata had a chemical complication, a contamination of the ores which defied treatment. It stood waiting, therefore, with the Copper Man in its entrails. Mining interests shook their collective heads. Now, there would have been a thing, if only the stuff were workable! As it was, of course, no one could touch it. Even fifty years ago, when taxes were less and optimism correspondingly more copious than nowadays, who would put fifty million dollars on an outsider—to start, never mind win—in a race which might take twenty years before the post was sighted?

Again Daniel Guggenheim and his family were the pioneers. They found a young Scandinavian American with an idea about the ore. They took that idea through the laboratory, the pilot plant, the semi-industrial scale. They cleared up the tangle of claims and rights on the Chuquicamata mountain. They came to terms with the Chilean government. They convinced the incredulous Britishers on the narrow-gauge railway which runs up into Bolivia that this was not just Yankee bluff and that there was going to be a big increase in the traffic to the port of Antofagasta, a hundred miles or so away. They built the housing and the hospitals and the water supply for thousands and thousands of workers, miles away from anywhere and miles above sea level.

All that took some twenty years, and then they had a paying concern—the cheapest producer of copper in the world.

Do not tell me that faith cannot move mountains—I have seen it happen! A hundred thousand tons of mountain all going up at once, one of the routine blasts which alter every few days, to some imperceptible extent, the vast crater of the mine. It is only the impulse of the moment that comes from explosives.

No one is likely to forget his first visit to Chuquicamata. Even from the explosives plant (of which I.C.I. is part owner) down on the desert at Rio Loa one could discern through the clear air the spoil tip of the mine, twenty miles away and four thousand feet higher up. But in that immense mountain setting the great size of it only came home to one as the car went up the last few miles of the dead straight concrete double ribbon road to the mine.

"Now how much stuff would you say there is in that dump?" asked the manager of the Rio Loa factory. (Most visitors, I may say, get asked this question.)

It was a rather large cake to guess, but I did my best. "A hundred million tons?" I suggested.

"Say, that's not so bad! It was a hundred and thirty million last time I asked. When they are on good production they dump out anywhere between half a million and a million tons of waste every month—ninety-odd tons of it for every two or three tons of copper."

That was twenty-five years ago. One ought to be able to say that it looks a great deal bigger now, but oddly enough it does not. The scale of everything is too big for the eye to take in.

This was the first of many visits. Each time I would find that features of the landscape, things about the size of the Great Orme or the Hereford Beacon, had vanished, or had even become concave. Things were done in such a big way that even the power station of the mine, which squats by the sea-side at Tocopilla over a hundred miles away, handy for the tankers, is the largest of its kind in South America.

Places like this do not exist on the memories of past enterprise. They have to go on being enterprising.

"The stockholders have put in another hundred and thirty million dollars down here since the war," said the mining engineer. "We kind of wondered whether they'd sore up on us, now the Chilean government keeps on increasing its cut. (They're talking of a flat seventy-five per cent of the profits. They get over sixty right now.) But we sure needed that capital appropriation for plant to keep us ahead of the game. The oxides and sulphides are changing over, and the mine is having to go underground." He waved the Indian's hammer at the ant-like activity before us. "There'll be nothing left above the surface in another twenty years—no extraction, that is. But they came through with the money, and that was fine. It would be a crime for a place like this, unique you might say, to get loused up on account of finance, or politics, or what have you. That's how I figure it, anyway. But then I'm not the Chile Exploration Company. I'm just the same kind of sucker as the Copper Man!"

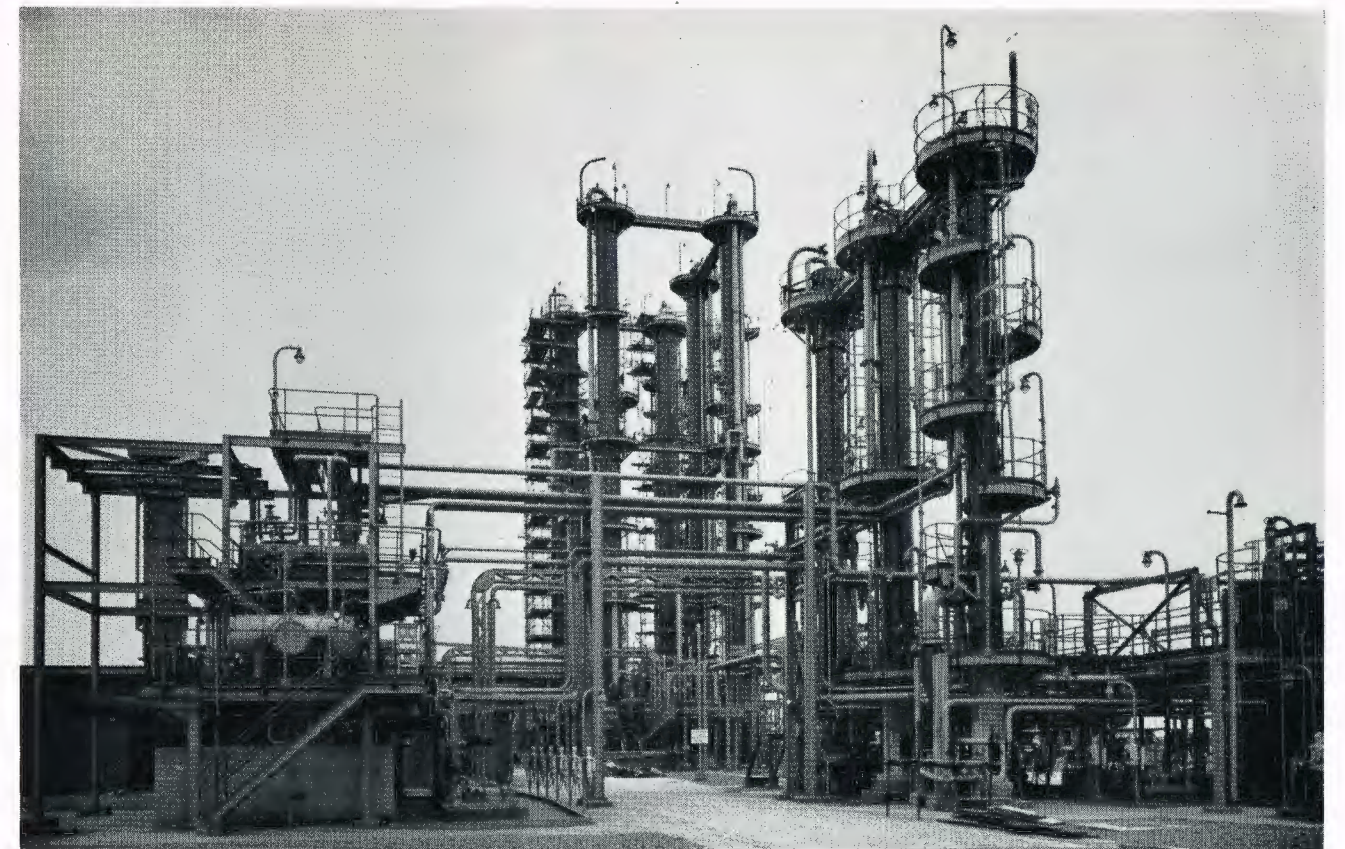
"How's that?" I asked.

"No honest-to-God miner ever really believes the roof will fall in!"

NEWS IN PICTURES



Trichloroethylene from General Chemicals Division for direct shipment to Detroit and Chicago is loaded on Swedish Chicago line's "Signeborg." Cargo also includes brass condenser tubes from Metals Division for Milwaukee. (See page 280)



New Wilton plant ready to go into production is Billingham's Butadiene plant. The gas produced will be raw material for adjoining 'Butakon' plant, which will make a range of products varying from rubber-like materials to hard resins



Moderator of the Church of Scotland, Dr. R. F. V. Scott, visited the I.C.I. Dumfries factories during his tour of the Presbytery of Dumfries. He is photographed above in the trades workshop of the Nobel factory



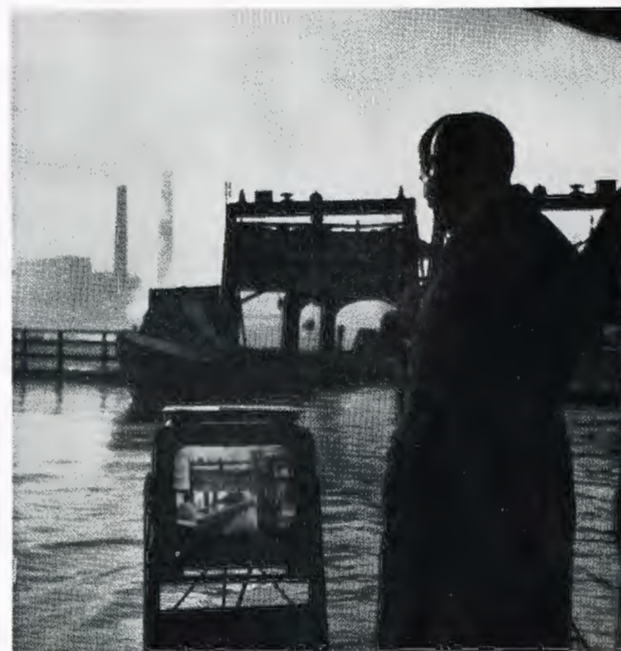
Uniform for Butlin's Holiday Camp girl hostesses this year includes white 'Terylene' pleated skirts. Above: three hostesses from the camp at Filey



Last month saw the final splicing of the last 200 miles of the transatlantic submarine telephone cable between Oban in Scotland and Clareville, Newfoundland. 'Alkathene,' the I.C.I. brand of polythene, has been used as an insulant. New telephone service should be open for commercial use by end of October. Above: End of first cable being pulled ashore at Oban. (Photograph by courtesy of H.M. Postmaster-General)



Game of the year for Ardeer's bowling enthusiasts was Directors v. Pensioners on 3rd July. Three rinks played for management, three for retired employees. Mr. Sam Mitchell sends down a wood, watched by Dr. A. C. Richardson, Mr. A. D. McLean, Mr. T. C. Hamilton, Mr. H. G. Rickard and Mr. W. Methven



Anderton Lift, famous Mid-Cheshire landmark, raises canal boats from the Weaver to Trent and Mersey Canal—a lift of over 50 ft. Salt barges from Middlewich are lowered to Anderton basin. This photograph of the lift, which averages 15-20 operations daily, was taken during a TV broadcast



Open day for Billingham's Commercial Works was off to a flying start with this new idea for a works tour in open wagons drawn by one of the factory locos



Stowmarket employees chose Calais for this year's summer outing on 14th July. Above: Some of the 120 employees with their families and friends photographed on board the "Queen of the Channel" after embarking at Clacton



Mossend pipe band, provided a colourful sight at Billingham Synthonia Club's Sports and Gala Day. Mascot of the band was Greer Little, daughter of big drummer George Little. H.M. factory at Mossend is run by Billingham Division



Base of lamp presented by Plastocraft Ltd. to the Russian Trade Delegation which recently visited Britain was of 'Perspex.' Engraved by hand, it represents over 100 hours' work



Randle Works Security Officer Mr. Gilbert Turner and Kim, one of Randle's two police dogs, appeared on an I.T.V. programme called "Dogs to the Rescue," televised from kennels at Bisley, where Kim was originally trained

I.C.I. NEWS

THE FIGHT AGAINST INFLATION

I.C.I. is to peg its home trade prices for chemicals, dyestuffs, explosives, fertilizers, fibres, paints, pharmaceuticals and plastics at least until 30th June 1957. This is subject to the proviso that no unexpected or exceptional factors intervene and that freight and fuel charges are not increased before that date.

A statement on the price freeze by the I.C.I. Board was issued to the national press at the end of July. The statement read:

"The Board of Imperial Chemical Industries Ltd. welcome the statement on inflation and prices which was recently issued jointly by the Federation of British Industries and other bodies.

"It has long been I.C.I.'s practice to reduce manufacturing costs by increasing productivity, improving efficiency, and by substantial capital expenditure on new and more efficient plants. It has also been a matter of I.C.I. policy to pass on to the consumer a substantial share of any such savings. Where, as during recent years, there have been heavy increases in costs due to fuel, freight, raw materials, wages and salaries, and capital charges, these increases have been partially absorbed by the improvement of internal efficiency and in part at the expense of profit margins.

"As a direct consequence of this policy of increasing productive efficiency in combination with price restraint, the weighted average of the Company's home trade selling prices has advanced by only two-thirds during the ten years since 1946, although the Purchase Price Index for the Company's raw materials has increased to two and a half times the level in 1946, and over the same period the I.C.I. Index of Earnings per Employee of all grades has doubled. The increase of two-thirds in the Company's Selling Price Index may be compared with the approximate doubling of the Board of Trade Wholesale Price Index during the same ten years' period.

"The Company believes that a general return to selling at prices which are quoted firm, for specific and appreciable periods of time, would be a most important step. Such methods were characteristic of British commercial practice prior to the war, and it would be beneficial if they were re-adopted as widely as possible.

"The Board of I.C.I., therefore, have no hesitation in declaring their agreement with the policy of price restraint

advocated by the F.B.I., and have also considered what further steps I.C.I. might now take in support of this policy.

"As a result, it has been decided to make no further increase in the home trade prices of the Company's chemicals, dyestuffs, explosives, fertilizers, fibres, paints, pharmaceuticals and plastics at least until 30th June 1957, provided no unexpected or exceptional factors intervene, and provided the Company does not incur any major increase in the cost of freight or fuel before that date.

"The production costs of certain of the Company's products, particularly those involving non-ferrous metals, depend markedly on imported raw materials which fluctuate widely in price, and for these the Board can do no more than continue their policy of price restraint.

"During recent years I.C.I. has lowered prices for a number of its products. The Company will continue its efforts to achieve further reductions whenever this becomes practicable, either as a result of continuing progress in productive efficiency by the Company, or because of lowered costs of raw materials or external services."

'ALKATHENE' PRICES DOWN

Following closely on the announcement of the I.C.I. price freeze came the news last month of cheaper 'Alkathene' (I.C.I.'s brand of polythene). The price of 'Alkathene' and its compounds is reduced by 3d. per lb. This is the third price reduction in three years. At the new selling price of 2s. 11d. per lb. polythene, because it is so light in weight, becomes one of the cheapest plastic materials.

I.C.I. IN U.S. PLASTICS PROJECT

I.C.I. has entered into an agreement with the Hercules Powder Company of U.S.A. to erect an \$11m. plant in Louisiana, Missouri, for the manufacture of methyl methacrylate.

Methyl methacrylate will be known to most people in I.C.I. in the form of 'Perspex.' In this form it is widely used in aircraft and for illuminated signs and corrugated roof lighting, and I.C.I. has been making it for 20 years.

The new plant, with a capacity of 15,000 tons per annum, will be built on a 20-acre site on the banks of the

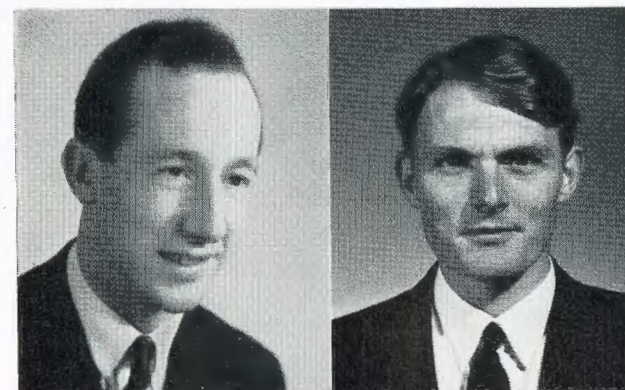
Mississippi, adjoining the Missouri ammonia works owned and operated by the Hercules Powder Company. The Hercules Missouri plant produces two key raw materials, ammonia and methanol, and natural gas is available from a nearby pipeline.

A team of engineers from Hercules is already over here conferring with General Chemicals and Plastics Divisions on the design of the plant. Production is scheduled to start during the latter half of 1958.

One man with a special interest in this new project is Dr. J. W. C. Crawford of Plastics Division. From the time when he discovered the process now used throughout the world for the synthesis of methyl methacrylate monomer Dr. Crawford has been closely associated with the development of methyl methacrylate manufacture and of the products made from it.

I.C.I.'S LAWN TENNIS INTERNATIONALS

For the second year running the English team for the lawn tennis international against Scotland has been captained by a member of I.C.I. staff. Last year's captain was Middlesex player Mr. Geoffrey Ward, an auditor in Head Office Treasurer's Department. This year Mr. F. Robin Kipping (Plastics Division) captained the English team



Mr. G. Ward

Mr. F. R. Kipping

for the Scottish International played at Edinburgh in July, while Geoffrey Ward was selected to lead the team against Ireland last month.

Geoffrey Ward joined Head Office as an internal auditor just over a year ago. A member of the All England Lawn Tennis Club, Wimbledon, he is ranked No. 10 in Britain. He played in the Wimbledon championships last June, when he was defeated in the men's singles by the Australian finalist, Ken Rosewall.

A former Cambridge Blue, Robin Kipping joined Plastics Division as a research chemist three years ago. He recently transferred to Sales Control Department at Plastics Division headquarters. He now plays regularly for the Cambridge county team. The Edinburgh match was his first as captain of an international team.

HEAD OFFICE

Sir Richard Lloyd-Roberts, C.B.E.

It was with a deep sense of shock that his many friends inside and outside I.C.I. learned of the tragic death of Richard Lloyd-Roberts on Sunday, 29th July, when he was killed instantaneously in his garden by the fall of a branch during a storm which raged in the south of England on that day.

Few men have been more widely known throughout the Company. Appointed the Company's first Chief Labour Officer in 1926, it was soon apparent throughout the merger that he was a man who by deep-seated conviction, by ability, enthusiasm and inexhaustible energy was ideally suited for the heavy responsibilities placed on him. Rarely can a profound sense of vocation have found fuller opportunity for fulfilment.

While he would be the first to acknowledge the inspiration and support which he received from the early directors of the Company and from their successors throughout the years, it was inevitable that, being in advance of his time in much of his thinking, he should encounter the resistances and frustrations which fall to the lot of all pioneers. Nevertheless his method was that of perseverance and persuasion rather than direction—and how persuasive he could be!

No mere catalogue of achievements can do justice to his lasting influence throughout I.C.I. Having behind him the great traditions and experience absorbed from his early days with Brunner, Mond & Co., he set himself the task of developing in the larger sphere of I.C.I. those philosophies, attitudes and practical steps on which alone can good industrial relations be founded. There is practically no aspect of the Company's present labour policy in which his early influence and guiding hand cannot be traced. But perhaps he would like to be remembered most for his work in developing the Works Council Scheme and in creating by informal contact and by formal agreement that close relationship which exists between I.C.I. and the many trade unions with which it is associated.

No tribute of this nature can be complete without reference to his wider influence on industrial relations throughout the country, through his work with the Ministry of Labour, both during the war and after his retirement from I.C.I., his presidency, for two terms of office, of the Institute of Personnel Management, and his never-failing generosity in placing his advice and experience at the service of others.

Very many past and present employees will remember "R.L.R." with gratitude and affection—and not least those in the Company's Labour Departments who had the privilege of being so closely associated with him. At work and at play his deep interest in others, his infectious enthusiasm and energy, secured for him a wide circle of friends in all walks of life. These will mourn his loss and will have heartfelt sympathy with his widow, so closely interested and concerned in all his activities, and with their daughter.

BILLINGHAM DIVISION

Award for Ammonia Works Chargehand

Several days after he had rescued a woman employee from certain injury, and possible death, under railway wagons at the Billingham factory, 48-year-old Mr. Clem Wainwright heard someone talking about the incident in Synthonia Club. A search was being made for the unknown rescuer. So Mr. Wainwright, an instrument artificer chargehand in Ammonia Works, came forward, but only because he feared blame for the accident might be wrongly placed.

As a result he was presented with a meritorious service award, a letter of appreciation from the Division Production Director, Mr. E. A. Blench, and a gift of money. The presentation was made by Mr. C. S. Tanner, Ammonia



Mr. Clem Wainwright (right) receives his award from Mr. C. S. Tanner

Works Engineer. Meritorious awards are made to employees who by prompt and courageous action prevent accidents to personnel or plant. The action must be of an exceptional nature and not in the normal duty of an employee.

Mr. Tanner said that on 2nd July Mr. Wainwright was waiting in the factory on his way to work for a line of passing railway trucks to cross the road. A woman employee in Engineering Works failed to see either the approaching trucks or the shunter's halt signal, and walked on.

She was hit by the leading wagon and fell with her legs across the track. Mr. Wainwright, despite the danger from the moving trucks, immediately dropped his bicycle and pulled her clear, thereby saving her from very serious injury.

Warm Welcome for Billingham's Cyclists

An especially warm reception will be waiting for cyclists arriving at Billingham's East Gate next winter.

Electric heating elements have been fitted under the surface of a new "lay-by" at the gate, where the cyclists have to dismount before walking through a subway with their bicycles to the factory road.

The heating elements have been fitted to prevent the surface freezing in winter and will reduce the danger of falls and skids in frosty weather to the dozens of cyclists who dismount at this point during peak traffic periods. The system was installed by the Engineering Works Service Section at Billingham.

FIBRES DIVISION

'Terylene' Stockings

The first 'Terylene' stockings are now on sale in the shops. Manufactured by Aristoc Ltd., they are made from I.C.I.'s recently introduced 25 denier 'Terylene' filament yarn. 'Terylene' is the first new stocking yarn of importance since the introduction of nylon nearly twenty years ago. Stockings of 'Terylene' share the quick drying and hard wearing properties of nylons and in addition have the advantage of a silky and warm handle.

At the moment 'Terylene' yarn supplies for stockings are limited to one thickness (25 denier), but research is at present going into the production of other finer yarns.

GENERAL CHEMICALS DIVISION

Anticipating the St. Lawrence Seaway

When the St. Lawrence Seaway project is completed in 1959 large ocean-going liners will be able to penetrate to the North American Great Lakes and discharge cargoes direct at one of the lakeside ports.

That is all in the future. Meanwhile two shipping companies, one British and one Swedish, have built special vessels which are sufficiently seaworthy for the Atlantic crossing and yet small enough to navigate the existing river, canal and lakes system.

Exporters, I.C.I. among them, are taking advantage of the sailings offered by these companies with a view to establishing their names in such ports as Detroit, Chicago, Milwaukee and Cleveland.

The picture reproduced on page 274 shows the first cargo of trichloroethylene being loaded on to the *Signeborg*, a vessel of the Swedish Line. It will be discharged at Detroit and Chicago together with glass from Lancashire, various British makes of cars and tractors, and steel sheets, a yacht and a speedboat from Sweden.

The use of this direct service, instead of the usual routing by sea to an Atlantic coast port and subsequent transport over land, not only reduces carriage and handling costs but also the risk of damage through frequent handling. The saving in delivery costs will help European exporters to become more competitive in the North American market.

Brown Trout

While fishing in a mountain lake in Merionethshire recently, Mr. N. V. Gregson landed a very fine specimen

brown trout weighing 5 lb. 5 oz. and thus fulfilled a long-standing ambition to catch a specimen fish. The secretary of the Welsh Angling Club, who saw the catch, stated that to the best of his knowledge it was the finest brown trout caught in Wales for many years.



Mr. N. V. Gregson

With a view to concentrating on specimen fish only Mr. Gregson and three local anglers four years ago bought a car specially for fishing. Most week-ends during the season find the party setting off for a favourite fishing spot, generally in Wales or Shropshire, and they think nothing of covering 200 miles in a day when fishing is the goal.

Mr. Gregson, who is chairman of the Angling Section of the General Chemicals Club, Runcorn, is employed at Castner-Kellner Works as a cell erector in the Cell Room.

METALS DIVISION

Kirkby's Soviet Visitors

During the latter part of July a Russian parliamentary delegation toured Britain, and to Kirkby Works fell the honour of showing the visitors a modern tube factory in operation. Kirkby was selected because of its up-to-date



The Russian delegates with members of I.C.I. staff at the Kirkby factory

equipment and high-speed processes, and the Russians showed great interest in the plant and products and asked many questions of the guides. Their tour of the mill lasted just under an hour, during which the visitors chatted with operators, presented a number of Soviet peace badges, and left behind them a distinct feeling of cordiality and interest.

Wauarlwydd Brothers on TV

Two brothers working at Wauarlwydd Factory, already well-known stage personalities with their songs at the piano act, are now making a name for themselves on TV. In addition to singing in harmony with Radcliffe, Ray plays six instruments, including the piano, and does all his own piano arrangements.

Their first real chance came in 1938, when Charlie Kunz was unavoidably called away from the Swansea Theatre



Radcliffe (left) and Ray

and Radcliffe and Ray were called in as substitutes. That was the first important step on the ladder of fame—Jack Hylton later took them to London, and they travelled extensively in Britain, the States, and Canada.

Engagements came so fast and furious that Radcliffe suffered a breakdown in health and was warned to cut down or even cut out professional engagements for a considerable time. That is how the brothers came to work at I.C.I., Radcliffe in Time Study and Ray in Distribution Department.

In July they appeared on TV with Kenneth Horne, and the attraction of this type of entertainment appealed to them so much that they are going to concentrate on television work—at week-ends and holiday times only, as neither of them has any intention of abandoning I.C.I. in favour of the arc lights.

PAINTS DIVISION

Mr. P. W. Marshall

Mr. P. W. Marshall, a former managing director of the Frederick Crane Chemical Co. and a member of the Paints Division board until his retirement in 1947, died on 9th July. He was 94.

Mr. Marshall was often referred to as the Grand Old Man of Paints Division. He was a pioneer in Britain's nitrocellulose lacquer industry, appreciating even in the last century the vital significance of these new materials, which were finally adopted in the motor industry in the 1920's. Connected with the Frederick Crane Co. from its inception,

he became general manager in 1895 and developed the business steadily. In 1926 the company was brought under the control of Nobel Chemical Finishes but was still managed locally in Birmingham, with Mr. Marshall as managing director. He later became a member of the Paints Division board.

After his retirement he still took the keenest interest in the affairs of the Division, and until his death in July he remained an active president of the Smethwick Recreation Club.

PLASTICS DIVISION

'Alkathene' and Big Ben

During the 1939-45 war a bomb exploded at the balcony level on the south side of the Clock Tower of the Palace of Westminster, demolishing part of the stone arcade and causing damage to the main cast iron roof. Temporary repairs were immediately put in hand, and these served their purpose pending full restoration. This was started in July 1955 and continued throughout the winter of 1955-56 and the summer of 1956. When the final at the top of the tower was dismantled a glass jar was discovered containing paper discs bearing the names of workmen



A view of Big Ben and the Houses of Parliament, showing the scaffolding on the clock tower. Below: The Resident Engineer of the Palace of Westminster about to place the 'Alkathene' cylinder in the apex of the upper roof of Big Ben.



the glass jar with a polythene cylinder. This was specially designed by Plastics Division Technical Service and Development Department to hold photostat copies of an official summary of the repairs carried out in 1956, a list of all officials and workmen concerned in the work, three

farthings, a short note stating that the container was made of 'Alkathene' and some I.C.I. sales literature relating to this product. It is not expected that the cylinder will be opened before A.D. 2006.

One-man Art Show at Billingham

Paintings which in July added a brilliant splash of colour to Billingham Public Library were the work of Mr. Frank Hutchinson, a processman in the Plastics Works Depolymerisation Plant at Billingham.

Frank Hutchinson has been interested in painting and drawing since boyhood and was for a time a student at the Colchester Art School. A member of the Cleveland Sketching Club, he usually makes rough sketches of his outdoor subjects in water colours and then, with the aid of



Mr. Frank Hutchinson

photographs, paints his pictures at home. He is also interested in portrait painting.

Employed at Plastics Works since 1947, he has painted many industrial scenes on Tees-side, and his recent one-man show at the Billingham library included studies of dockside districts of West Hartlepool and scenes on the Tees estuary.

Frank Hutchinson has another hobby—playing the guitar—and, when he can be persuaded to lay down his paint brush, he and his son Norman, also a guitarist, give a concert that is well worth hearing.

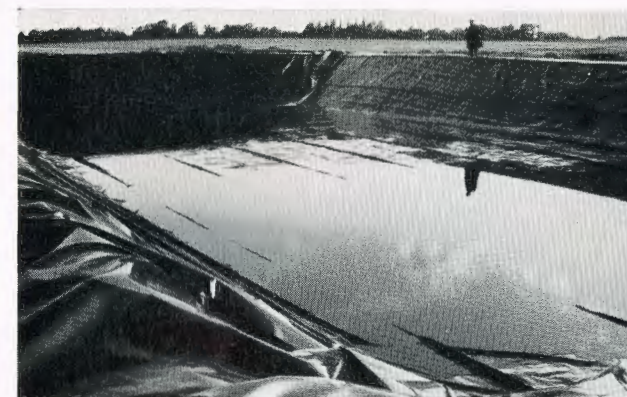
BRITISH VISQUEEN

Water Storage at Malton

A single sheet of black 'Visqueen' 56 yards long and 33 yards wide has been used to line a large water storage tank at Malton aerodrome. The water storage scheme is for supplies for training National Fire Servicemen.

The 'Visqueen' sheet was prefabricated at Stevenage and weighed nearly half a ton. It was folded in concertina fashion to 4 ft. 6 in. wide and then rolled up for transport.

The technical service team responsible for laying the sheet were scared of handling such a vast "sail" in windy weather and waited eight days for a favourable weather forecast. On the ninth day, in spite of a good report, they



The water storage tank at Malton is lined with a single sheet of black 'Visqueen'

found on arrival a windswept aerodrome with a 25-knot breeze. Finally a decision was made to lay the sheet at dawn. The sheet was unrolled along one bank in the light of the car headlamps, the weather being a flat calm. A squad of volunteer firemen was briefed, and as dawn broke the sheet was dragged across the hole. Ten minutes later (and half an hour before sun-up) water from hoses was pumped in. The reservoir has a half-million gallon capacity.

PLANT PROTECTION LTD.

Board Changes

Mr. F. W. Sugden, a director of Plant Protection Ltd. since 1943, retired from the Company's service at the end of last month. Dr. G. Watts Padwick of Central Agricultural Control takes Mr. Sugden's place on the board of Plant Protection Ltd.

With Mr. Frank Sugden's retirement a chapter in the story linking Yorkshire, the Dyestuffs Division and Plant Protection is completed. His connection with the Company began as long ago as 1911, when he joined Read Holliday & Sons, later absorbed into the British Dyestuffs Corporation. Following the 1927 merger he became dyestuffs manager at Bristol and in 1932 was appointed assistant sales manager of the Dyestuffs Division. It was at this stage that the Division turned its attention to pesticides for use in agriculture, and this new section was added to Mr. Sugden's many other interests.



Mr. F. W. Sugden

Dr. G. Watts Padwick

On the formation of Plant Protection Ltd. in 1937 Mr. Sugden became the new company's general sales manager. He was appointed to the board in 1943 and ten years later was made Commercial Director. He has been a member of the executive of the Association of British Insecticide Manufacturers for many years and last year was the Association's chairman.

Dr. Padwick, who succeeds Mr. Sugden, joined I.C.I. in 1935 as a plant pathologist and worked on mercurial and thiram seed dressings at Jealott's Hill. From 1937 to 1944 he was Imperial Mycologist to the Indian Government and later reorganised agricultural training and research in Bengal after the famine of the early forties.

Already a graduate of the University of Alberta, Dr. Padwick became a D.Sc. of London University in 1945. A year later he rejoined I.C.I. Since then he has been concerned with overseas development work on fertilizers and plant protection chemicals and has been in charge of C.A.C.'s Overseas Department for the last seven years.

OUR NEXT ISSUE

The romance of a fibre whose raw material starts as a groundnut and ends up as something closely resembling wool has been well publicised. We have already had one article on 'Ardil' in the *Magazine* in recent years, but no apology is made for returning to this subject again, particularly since the erection of a full-scale factory to make 'Ardil' at Dumfries. The article will be illustrated by some unusually fine photographs taken by Walter Nurnberg and has been written by James Thurlby of Central Publicity Department. It will describe the way in which this new fibre—often called the good companion fibre because of its soft feel and its adaptability in combination with other fibres—has established a very definite niche for itself in the textile world. The sales of 'Ardil' are mounting slowly but surely, and its future is undoubtedly good, more particularly as quality is improving all the time.

Our colour feature is written by an I.C.I. weather expert, formerly one of the team engaged in predicting the weather for the D-Day landings in Normandy and now deputy head of the combined C.A.C./Plant Protection publicity department. Using a number of colour photographs of cloud formations, Dr. Lawrence Hogben endeavours to give a popular scientific explanation of the different kinds of clouds we see in the sky—what they portend and why.

Lastly, an amusing article from Mr. Gordon Long (previously planned for August) entitled "Mad Dogs and Englishmen."



The Reluctant Rallyist

By James Taylor

I WAS sitting quietly at home one evening when the blow fell. My younger boy, Rob, who is in his final year at the London Hospital, said "I think we should go in for motor rallying." I gathered it was the best possible tonic for tired businessmen. I explained I didn't need a tonic, and it seemed more like a powerful purgative to me. I skated on the ice, like the ducks on the Round Pond, for days, but the young always vanquish the aged. I had to get an R.A.C. Special Driving Licence, and a photograph to stick on the top corner. I hadn't a photo, but my secretary was against me—she found one; she even went to the R.A.C. with the 10s. required. Women are always on the side of youth.

Our good old 2½-litre Riley was to be the first sacrifice on the altar of rallying.

A modest local rally was chosen. We got the Ordnance Survey 1 in. maps required. We folded them in ways unknown to science, so that the full area could be surveyed on a board which accommodated only a quarter. We bought "Romers" and an average speed indicator, and wrote to the insurance company. I added various codicils to my last will and testament and spent quite a time in relearning how to use a slide rule.

We set out at crack of dawn for a pub on the outskirts of greater London. Our watches were synchronised, the car was scrutinised, and we stood proudly among a flight of sports cars and soap-boxes. Armed with our route card, we set off and motored the Riley competently round the English carpet. I was navigator and co-driver, one of the—though I did not know it at the time—unprivileged classes. You can always pick them out by their grey hairs.

I navigated to village greens to take information off indicator boards, to village inns for their names, and even made a quick dash up a hill to copy the inscription from someone's folly at the top. But he was not the only one with a folly! It had been too easy, and we were puffed up. True, we found the English country names a bit tough going, being accustomed to the simpler Scottish nomenclature like "Inchnadamph" and "Achiltibuie"; but we got by. But Nemesis was upon us. We turned right at a T-junction, according to the route card, and plunged

down a steep hill into a ploughed field where it had recently rained. I think there must have been an error in the O.S.; but anyhow there we were, after a final slither in the mud, wedged against a gatepost with no traction.

Nothing could be done about that gatepost. It was too solid. If I had had some dynamite I could have "tree stumped" it. I hadn't the means. A sad look of conscience came into the face of my younger son, and I thought if we ever get out of this, much good has been done, for he realises he is wrong. He opened the car and took out his mother's motor rug, and before my outraged eyes did a Sir Walter Raleigh in the mud. The back wheels whirled, the rug was caught, and there was traction. The car sloughed along the gatepost, removing the protective film of I.C.I. cellulose; the door handle fractured with an outraged crunch, and the rear mudguard folded up like an Arab's tent.

"It could have happened anywhere," said my younger son. We were clear for the moment until the hazard of the muddy hill loomed large and nearly defeated us, but the rug (now in two pieces) got us through. It was a great tribute to the Stewart tartan.

By this time our watch informed us that we were deemed to have retired, so we went home, both, I thought, wiser, and one of us a happier man. Happiness in this world is fleeting, and so it proved. I had to come to terms. I said he could find a new navigator. He suggested it might be possible to improve my navigation if I worked hard enough at it. He thought he might employ his sister in the back seat to check up on my calculations. She is doing P.P.E. (Politics, Philosophy and Economics) at Oxford and might be up to the necessary standard of education. He felt that his elder brother, who had been trained as a navigator in the R.A.F., could help. He pointed out that the R.A.F. had to navigate in three dimensions, while I only had two.

I was reluctant; but I was persuaded, and after a period of recuperation and rehabilitation we entered for our second rally.

Sister was in the front seat. She had given all that P.P.E. had to offer. The plans were as perfect as politics, philosophy and economics could make them. In addition, medicine had made its contribution, and

as it was a night rally there were "wakey-wakey" pills, vitamin tablets and glucose sweets. There was also a new and formidable panel of instruments. There were a magnetic compass, an average speed indicator, and a magnificent map-reading instrument. I had never seen such an array since I was an honours physics student. I was provided with an extra large map board which confined me to the back seat. P.P.E. was to do all the timing, communication of information, magnetic variation and the Board of Trade indices where necessary. She had also read two pamphlets on work study, but when she got out the stopwatch I told her that the Navigators' Union objected to the use of a stopwatch and were not prepared to accept it without an intermediate conference. She felt I was sincere but misguided.

I thought wistfully of the uncomplicated life of a Group Director and longed for the shelter of I.C. House; but into the night we went proudly and with high hopes.

The route started from Croydon, and quite soon there was a sharp right turn, followed by a "bear right." Something certainly went wrong, for we found ourselves motoring round Purley for twenty minutes. We got the Riley on course again, sought our various six-point references, and then pushed hard for the control at a roundabout near Basingstoke. No control was to be seen. The navigator came in for the usual vituperation, but he was adamant. This was the reference. The control had folded its tent and stolen silently away. We had over-run our time. We were deemed to have retired.

The temperature in the car rose high. The shining instruments stared in silent rebuke. We threw away our "wakey-wakey" pills and flogged the box for home and bed. After a sleep we were on speaking terms again and a conference was held. We had learned the hard way. It was obvious that if we were to gain experience, particularly in driving tests, it was absolutely necessary to survive. We worked out a plan for survival. We developed a strategy. Our philosophy was simple. In future we would sacrifice any number of points; incur any amount of penalties; but we would get to the section control in time to do the special tests and pass on to the next section.

No longer did we dream visions of engraved cups and plaques, but with chastened hearts we started along the road to survival. It was P.P.E. who analysed the position. We now had our philosophy, our political belief in survival; but the economics were getting the principal driver down. His life savings had gone on the array of instruments; his small packet of

stocks and shares had gone in fees for clubs and entries. A new issue was required, and the parental underwriters were dazzled by a new prospectus into taking up the shares. This time he sought his native heath and entered the Highland Rally.

The Road to the Isles, the familiar simple Gaelic names—here was the place for survival of any lost cause! Proudly we mounted our number plates and set off in the direction of Hadrian's Wall.

At 9.03 a.m. from the control in Glasgow we took off. The young medical was driving, P.P.E. was in the front passenger seat, and on the rear seat crouched the old electronic brain with his digital computer. The route went to Abington by devious ways. The average speed indicator busily gave its information; the night hours stole sweetly by. The little cosmos of the Riley hummed with activity as under the control of a master mind.

After Abington, Rob took over navigation for the Ayrshire section and the co-driver occupied the driving seat. All went well; but at Auchinleck we turned off the main road right and followed the route book, and I was amazed after some minutes' driving to enter a dead end into a colliery and brickyard. Sadly we turned from the lights of the pit into the dark unfriendly night and put into practice our plan for survival.

We survived. In the following section we went well and truly up the creek. Six-figure O.S. references we could deal with, but this time we had reference points defined by the intersection of arcs of defined radii. We lacked compasses, and the task of pinpointing references by drawing arcs with pieces of string on a moving map platform proved singularly unrewarding. In the dawn, from a child watching the rally in a village, we purchased a pair of compasses for 5s. Alas, history did not repeat itself, and the instrument remained unused. Nevertheless we survived—at a cost.

The following section moved first east and then into Highland country, and it was in this paradise that the plagues of Egypt and the trials of Job descended on us.

First, a flat tyre—fair enough—soon rectified; but this was only a carefully calculated prelude to a succession of devilry. Scarcely had the tyre been changed when an incredible incident occurred on a rocky road. Out of the road stuck up a thin wedge of rock, and while pulling into the side to pass a large vehicle this wedge insinuated itself, without damaging the tyres at all, first under the front near rim and then under the back, pushing them up by several inches and buckling the rims. The unbalanced wheels shrieked, the steering column juddered and thrashed, but the tubes held.

We fought on. At a local garage we got the mechanic to flog the rims back into shape with a sledge hammer. It was not exactly a precision engineering job, but there certainly was an amelioration, and to the tune of the blows of the sledge hammer the flat was fixed as well and petrol taken aboard.

We struggled on; went north to Loch Earn and then over the incredible road to Amulree. An average of 30 m.p.h. was required. We gave what was required. Suddenly there was a throaty roar from the engine and the sound of tin cans being bumped along the road. We had lost our silencer, and the sad remains trailed from the undercarriage along the mountain road. We were out! The two males looked at each other sadly, but P.P.E. jumped out of the car. There was a fanatical gleam in her eyes; something of her wild Stewart and Lennox ancestors burst through the veneer of civilisation. "Strip the silencer and cool it in the burn!" she commanded. We crawled under and tore our nails and burned our hands. Finally we got the fore and aft silencers adrift and into the mountain burn. The remains were wrapped in a sheet, and P.P.E. bore them across her knee as in the old days the Scottish women took their sons after battle.

"Bash on!" she cried—"Bash on regardless!" The car took off like a Messerschmitt. We lost a hundred or more marks, but survived and arrived at Pitlochry, the final control of the day, in time. Twenty hours' motoring! Never in the history of rallies had so many points been lost in so few hours; but we were still in the rally. The car was impounded for the night. The next morning the controller had to move his position to keep out of the exhaust, and the car started up with a roar that reverberated through the Pitlochry hills. Off to the garage we went, nursing our silencer. In three-quarters of an hour it was fixed on again. Not much time left, but possible if three checks were omitted.

The rest of the day passed reasonably until the late afternoon, when the silencer again parted company on a wet dicey section of mountain road. Once again it was nursed to the control and left with the impounded car. Again the price of survival had been high, but all the special tests had been done.

Next morning as soon as the car came out of the control it was rushed along to the local garage. This time the silencer was fixed in a bare twenty minutes. They were gaining experience. Not much time for the first section to Braemar! The driver posted in his seat to help the horses; P.P.E. urged the chariot on,

the navigator in the back said nothing—he was beyond speech, beyond communication—he was out of this world. With a quarter of a minute to spare the Riley pulled in at the control. P.P.E. looked at her brother and remarked "You sure motored that section!"

The tide had turned. The day ended with no incidents, except that a T.R.2 ran into us or we ran into a T.R.2—there are always two points of view—and with no marks lost for navigation and good marks for the special tests. The doctrine of survival had operated. All cars of our class had retired except ourselves and two others, so we finished the day at Gleneagles with a few hundred marks less than anyone else who had survived and with a third prize in our class, and a small plaque to show we had completed the rally. We took the road to the South in happy mood.

Appetite had been whetted, and fixture cards were inspected carefully for possibles.

The "Little Rally" of the London Motor Club with its superbly drafted route card passed off smoothly and enjoyably, and ended not ignominiously in a middle position.

Hopes were being built up, but the next rally brought a jolt to earth with its difficult navigation problems. We gained experience, but at the price of being handsomely at the bottom. This may have been due to the fact that P.P.E. was back at Oxford and not available.

We were tempted and fell for the Morecambe Rally—a tough national event. We started off from Luton at 5.40 p.m. for Skipton. A thunderstorm brewed up and our back rally plate was washed off. Before Doncaster we had lost three gallons of petrol and three-quarters of an hour in detecting and repairing a leak. Fortunately there was plenty of time to arrive at the Skipton control on time and even get a packet of fish—without chips—which was the only sustenance available locally at that hour.

The first section in the night took us along very dicey narrow roads with frequent narrow openings in drystone dykes and sharp corners. Some of the cars didn't like it and mounted the verge. We passed a Jag perched at an angle of 50° with the driver smoking a soothing cigarette, and later a Volkswagen had turned completely over. In the second section the Riley hit trouble going through a ford. It sat on the step as we emerged and took off our silencer. We motored to Penrith and got it repaired. The repair took 2½ hours, and we had to cut the Lake District section and go straight to the check points nearer Morecambe. We

reached Morecambe in time to do the afternoon driving tests on the promenade. It was a cold windy day with few spectators.

Sunday was a fine, lovely day, and the populace was out in force to see the promenade tests. We progressed along the prom from test to test, including the "wobble-wobble," doing creditably but not brilliantly, until the last one, the "Monte-Morecambe." In this the Riley was taken round the first end pylon magnificently. The speed was superb, and on turning and braking the tail of the car came round just like the textbook says. A loud burst of applause went up from the spectators. This was motoring! At the next pylon the tail did not come round quite so quickly. There was a nasty crunch as the near wing came into contact with the prom wall and a solitary wheel disc rolled bravely across the course. Still louder applause went up from the audience!

It was a very little plaque we took away from Morecambe, but the doctrine of survival had worked out again and we were gaining experience.

Our next effort was the Scottish International Rally.

Rob had shied off it because of the expense, but to the navigator it looked civilised and he pushed for it. Expectations were fulfilled, for the route card was supplied beforehand and it was possible to plot the course on a stable platform. This was joy. Also it was not night navigation.

The Riley pulled out from the S.R.A.C., Glasgow, at 9.44 a.m. on a brave fine Monday morning and promptly went wrong in Glasgow, which the navigator was understood to have known for twenty-five years. There were a few words but no harm done, and some pleasant motoring to Turnberry followed. The Riley did well in the flying half-mile against a headwind, but the parking test got us nowhere. The route continued through lovely Galloway and the Nith Valley, over the hills to Crawfordjohn, and by Kincardine Bridge to the Logie Bank test, where we came on the pylon round the corner too quickly and lost time by having to reverse. The navigator sadly finished the section to the final control at Gleneagles. His record was white and clean—he had even enjoyed the scenery—but what was "perfect" navigation with "imperfect" tests!

The rest of the week passed sweetly in a perfect setting.

Navigation was not too onerous and there was adequate time to allow for one or two plunges down the wrong road. The weather was superb, and it was possible to dally occasionally. Every now and again the

flock of T.R.2s and M.G.s pushed past in their restless haste from check to check.

There was no vice in the road sections, but the rally draughtsmen had put their guile into the special tests. What imagination they displayed! What knowledge of human frailties! The discussions on tactics were countless, and two seasoned rallyists at our table at Gleneagles gave us invaluable advice and tips which we profitably put into operation.

In one test a ford was traversed and a timed stop at a line at the far side had to be made. Two hazards were apparent—loss of brakes from entry of water, and drowning of the engine. We decided to ignore the ford, and as we passed through with the handbrake slightly on a magnificent mass of water shot up all over the car. We braked and stopped at the line. A moment later the engine coughed and stuttered, but the test was over.

Another piece of fun was provided by the starting test on a gradient at Rest and Be Thankful. A button was placed just behind the back tyre, and if the car slipped back by as little as a quarter of an inch a bell rang, and that was it. "For Whom the Bell Tolls"—and it tolled for many—had a special significance.

The mile climb up Rest and Be Thankful was an exhilarating experience. A Sunbeam in our class put up a first-class performance. We had the best time coming down and also the best cloud of blue smoke and burning rubber on braking.

The official braking test, in which one had to achieve a speed between 30 and 35.4 and then brake when a red light went on, was a bit of mystery and defeated many, but by luck or good management we got 11 marks out of a possible 20.

As the second and subsequent days passed it looked as if we might have a good chance of being first in our class, and excitement mounted. On the Thursday evening we were 20 marks ahead, and the navigator was told in no uncertain terms what would happen if the last road section to Glasgow was other than perfect. We feared many things, including Act of God and careless motorists, and we nursed the Riley round the corners more carefully than a mother nurses her firstborn. No motoring that day! As we pulled in at the final control in Glasgow we heaved sighs of relief—the reluctant rallyist tucked away his navigating board and instruments, the driver dreamed of Monte Carlo Rallies, and two days later P.P.E. claimed it as a triumph of the doctrine of survival, which indeed it was.



"Campers"

Photo by A. Walker (Billingham Division)